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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/730,941	12/10/2003	Jae Suk Lee	021906-0306952	6290

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PILLSBURY WINTHROP SHAW PITTMAN, LLP
P.O. BOX 10500
MCLEAN, VA 22102

EXAMINER	
LANDAU, MATTHEW C	
ART UNIT	PAPER NUMBER
2815	

DATE MAILED: 08/25/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/730,941	LEE, JAE SUK	
	Examiner	Art Unit	
	Matthew Landau	2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 June 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) *7-12 and 14* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6 and 13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

The restriction requirement mailed on June 27, 2005 indicated that claim 7 was a linking claim. However, it is now clear that claim 7 is not a linking claim. The product of claim 1 can be made by a materially different process that that of claim 7. For example, the product of claim 1 can be made by a method wherein the Cu layer is formed prior to forming the first and/or second Ru layers.

Since Applicant has already elected Group I, claims 7-12 and 14 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made without traverse in the reply filed on July 18, 2005.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-6 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kutsunai et al. (US PGPub 2002/055223, hereinafter Kutsunai) in view of Buchanan et al. (US Pat. 6,984,591, hereinafter Buchanan).

Regarding claims 1 and 4, Figure 1C of Kutsunai discloses a dielectric pattern 103 formed on a surface of a substrate 100; a first Ru layer 108A (paragraph [0096]) formed on the

dielectric pattern; an oxide film 115A (Ru oxide) (paragraph [0096]) on the first Ru layer; a second conductive layer 110A formed in contact with the oxide film; and a Cu layer 108A formed on the second Ru layer. The limitation "formed by oxidizing an upper part of the first Ru layer" is merely a product-by-process limitation that does not structurally distinguish the claimed invention over the prior art. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 227 USPQ 964, 966. Further regarding claim 4, the product-by-process limitation "formed by a plasma treatment using N_2O or O_2" does not structurally/patentably distinguish the claimed invention over Kutsunai. Note that Kutsunai discloses layer 108A includes a layer of copper nitride (paragraph [0095]). Therefore, layer 108A can be considered a copper layer. The difference between Kutsunai and the claimed invention is the second conductive layer is a Ru layer. Kutsunai discloses layer 110A is a lower capacitor electrode made of Pt (paragraph [0097]). Figure 30 of Buchanan discloses a capacitor device wherein the lower electrode 33 is made of Ru or Pt (col. 27, lines 52-54). In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Kutsunai by using Ru as the lower electrode material for the purpose of selecting an equivalent material known to be used for the same purpose (see MPEP 2144.06).

Regarding claim 2, Kutsunai does not specifically disclose the substrate is a silicon substrate. However, silicon substrates are extremely well known in the art. Therefore, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Kutsunai by using a silicon substrate for the purpose of selecting a inexpensive,

readily available semiconductor material that can be easily integrated into existing process technologies.

Regarding claim 3, the limitation "the first Ru layer and the second Ru layer are formed by using a sputtering or CVD (chemical vapor deposition)" is merely a product-by-process limitation that does not structurally distinguish the claimed invention over the Kutsunai. A further difference between Kutsunai and the claimed invention is the first and second layers have a thickness in a range from about 80 angstroms to about 120 angstroms. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the invention of Kutsunai by using the claimed range, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claim 5, the product-by-process limitation "obtained by oxidizing an upper part of the first Ru layer" does not structurally/patentably distinguish the claimed invention over the prior art. The difference between Kutsunai and the claimed invention is the thickness of the oxide film is about 250 angstroms. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the invention of Kutsunai by using the claimed range, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claim 6, a further difference between Kutsunai and the claimed invention is the ratio of x:y = 1:2 (Ru_xO_y). Figure 30 of Buchanan discloses a conductive barrier layer 32 formed of RuO_2 (col. 27, lines 45-49). In view of such teaching, it would have been obvious to

the ordinary artisan at the time the invention was made to modify the invention of Kutsunai by using the stoichiometry of RuO_2 (wherein x:y = 1:2) as taught by Buchanan, since RuO_2 is the most readily formed and stable stoichiometry for ruthenium oxide.

Regarding claim 13, after the above combination, Kutsunai discloses first Ru layer 114A, the oxide film 115A, and the second Ru layer 110A form a conductive barrier structure. The limitation "for the Cu layer" is merely a recitation of intended use that does not structurally distinguish the claimed invention over the prior art. A recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim.

Claims 1-6 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aggarwai et al. (US Pat. 6,635,497, hereinafter Aggarwai) in view of Kutsunai.

Regarding claims 1, 2, 4, and 6, Figures 3 and 17 of Aggarwai disclose a dielectric pattern 112 formed on a silicon substrate 102 (col. 7, line 67 – col. 8, line 1); a first Ir layer formed on the dielectric pattern; an IrO_2 oxide film formed on the first Ir layer; a second Ir layer formed in contact with the oxide film; and a Cu layer 114 (col. 8, lines 53-55) formed on the second Ru layer. The limitation "formed by oxidizing an upper part of the first Ru layer" is merely a product-by-process limitation that does not structurally distinguish the claimed invention over the prior art. The patentability of a product does not depend on its method of

production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 227 USPQ 964, 966. Further regarding claim 4, the product-by-process limitation "formed by a plasma treatment using N_2O or O_2" does not structurally/patentably distinguish the claimed invention over the Aggarwai. The difference between Aggarwai and the claimed invention is the first and second layers are made of Ru, and the oxide film is made of Ru oxide. Figure 1C of Kutsunai discloses a conductive barrier layers 114A/115A that are made of Ru and Ru oxide or Ir and Ir oxide (paragraph [0096]). In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Aggarwai by using Ru and Ru oxide instead of Ir and Ir oxide for the purpose of selecting an equivalent material known to be used for the same purpose (see MPEP 2144.06).

Regarding claim 3, the limitation "the first Ru layer and the second Ru layer are formed by using a sputtering or CVD (chemical vapor deposition)" is merely a product-by-process limitation that does not structurally distinguish the claimed invention over the Aggarwai. A further difference between Aggarwai and the claimed invention is the first and second layers have a thickness in a range from about 80 angstroms to about 120 angstroms. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the invention of Aggarwai by using the claimed range, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claim 5, the product-by-process limitation "obtained by oxidizing an upper part of the first Ru layer" does not structurally/patentably distinguish the claimed invention over the prior art. The difference between Aggarwai and the claimed invention is the thickness of the oxide film is about 250 angstroms. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the invention of Aggarwai by using the claimed range, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claim 13, after the above combination, Aggarwai discloses first Ru layer, the oxide film, and the second Ru layer form a conductive barrier structure. The limitation "for the Cu layer" is merely a recitation of intended use that does not structurally distinguish the claimed invention over the prior art. A recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim.

Response to Arguments

Applicant's arguments with respect to claims 1-6 and 13 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew C. Landau whose telephone number is (571) 272-1731.

The examiner can normally be reached from 8:30 AM - 5:30 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Parker can be reached on (571) 272-2298. The fax phone numbers for the organization where this application or proceeding is assigned are (571) 273-8300 for regular communications and (571) 273-8300 for After Final communications.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should any questions arise regarding access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Matthew C. Landau

August 19, 2006